RICK SNYDER
GOVERNOR

C. HEIDI GRETHER
DIRECTOR

July 17, 2017

VIA E-MAIL and U.S. MAIL

Mr. L. Chase Fortenberry, P.G.
Manager – Environmental Engineering, Environmental Affairs
Georgia-Pacific LLC
133 Peachtree Street, NE
Atlanta, Georgia 30303

Dear Mr. Fortenberry:

SUBJECT: Michigan Department of Environmental Quality Comments for Operable Unit 5 (OU5) Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site, Area 4 Draft Supplemental Remedial Investigation (SRI) Report, dated September 2, 2016, Prepared by Amec Foster Wheeler, Environment & Infrastructure, Inc.

The Michigan Department of Environmental Quality (MDEQ) has prepared these comments based on our review of the above referenced document, in addition to ongoing discussions with the United States Environmental Protection Agency (USEPA), and Georgia-Pacific. The MDEQ supports the USEPA's disapproval of this document pursuant to Section X(39)(d) of the Administrative Order by Consent.

The MDEQ has reviewed the document and identified the following major concerns. In addition, a detailed comment matrix and associated MDEQ work products regarding the SRI report (Report) are provided as an attachment to this letter.

- The Report needs to discuss Toxicity Equivalent Quotient (TEQ) impacts on an equal footing with polychlorinated biphenyls (PCBs) as it relates to terrestrial exposures.

- The Report needs to add additional information regarding the uncertainties with TEQ distribution in the floodplain. The original sampling plan was designed to evaluate TEQ in Area 4 as it was seen as a data gap. At the time sampling was being planned, the number of samples that were run for analysis necessary to calculate TEQ was limited, as it was believed that TEQ risks would be subordinate to risks from PCBs. As you are aware, these assumptions were proven wrong, and TEQ risk in the floodplain has been found to be dominated by Dioxin and Furan congeners. As such, we are in a unique position of not being able to describe TEQ distribution with the same clarity that we can describe PCB distribution, because of the paucity of data generated by the limited sampling. Further refinement of the TEQ distribution in the floodplain is necessary and will require more sophisticated mapping techniques and comprehensive data collection efforts. These facts need to be clear in the Report, and these facts need to be considered in future sample designs for other areas of OU5. Figures, such as those presented in Attachment 1, showing basic correlations between total TEQs and PCBs for floodplain soils should be presented in the SRI. Prior to the feasibility study process, methodology such as that presented in Attachment 1, Appendix 1, or similar, should be utilized to develop statistically based remedial footprints that propagate uncertainty and, ultimately, develop a protective floodplain soil Preliminary Remediation Goal based on total TEQ.

- The Risk Assessment (RA) approach presented in the Report is flawed. The MDEQ has had several discussions with your team, in advance of this comment letter, describing our concerns with the RA process presented in the Report. It is our understanding that Amec Foster Wheeler has already begun making modifications to the RA process, based on input from the various agencies, for inclusion in the revised Report. Further, it is understood that the Work Group will continue to work through the remaining issues with RA development for TEQ risk, prior to submission of the revised Report.

- The PCB kriging estimate maps provided in the Report (e.g., Figures 4-19 through 4-45) are necessary tools for better understanding contaminant distribution, but they do not accurately depict the complex nature of the distribution of contaminants at the site (nor can any map). These maps will be used in the future feasibility study process to estimate contaminant concentration and distribution for generating volumes for risk management and cost estimating. However, additional design sampling will be necessary in the remedial design process to define remedial footprints. These PCB kriging estimate maps in the remedial investigation are not correct and do not communicate the uncertainties associated with our understanding of contaminant distribution.

- As with Area 2, the dam-out scenario model is of limited use for estimating future conditions, because a simplistic trapezoidal channel was selected for the model runs. This model should be used for broad ranging estimates only. Additionally, the Trowbridge Inundation Study, dated April 2005, should be included by reference in the SRI report and its findings checked against the current condition model output to evaluate model uncertainties.

The comments and associated work products in the attachment cover the key issues identified by the MDEQ review. The MDEQ appreciates the opportunity to have reviewed and commented on this document. If there are any questions in regard to the MDEQ's comments related to the review of the document, please contact me at 517-284-5072; peabodyd@michigan.gov; or MDEQ, Remediation and Redevelopment Division, P.O. Box 30426, Lansing, MI 48909-7926.

The MDEQ looks forward to continued progress for Area 4.

Sincerely,

Daniel h Peabody

Daniel Peabody
Project Manager
Site Assessment and Site Management Unit
Superfund Section
Remediation and Redevelopment Division
517-284-5072

Attachment: MDEQ Comment Matrix
Attachment 1: Comments on Remediation Footprint for Floodplain Soils

cc/enc: Ms. Cynthia Draper, Amec Foster Wheeler
Dr. Keegan Roberts, CDM Smith
Ms. Rebecca Frey, USEPA
Mr. James Saric, USEPA
Mr. David Kline, MDEQ
Ms. Kristi Zakrzewski, MDEQ
Mr. John Bradley, MDEQ

ATTACHMENT 1

MDEQ's Comments on the DRAFT SRI Report, Area 4, OU-5 Kalamazoo River Superfund Site (09/09/2016)

July 14, 2017

Comments on Remediation Footprint for Floodplain Soils

Issues and Suggested Approaches for Evaluating Floodplain Total Dioxin-Like TEQ

AMEC/GP has proposed to develop an 11 ppm PCB RAL footprint, followed by overlaying Dioxin (D)/Furan (F) TEQ data to understand visually if the 11 ppm footprint indeed captures all individual samples exceeding some specified RAL for TEQ. As discussed below and shown graphically, analyses conducted by MDEQ, indicate that more rigorous analyses are necessary.

1. MDEQ suggests that total TEQ (tTEQ) should be examined outside of the 11 ppm PCB footprint. Inside that footprint, home range analysis should be sufficient to protect avian receptors. Outside of the footprint, however, any need for risk management should be evaluated on the basis of tTEQ, not D/F TEQ alone. MDEQ cannot identify any logic that would justify not examining tTEQ outside of the PCB footprint.

2. Any ecologically- based RAL needs to be developed for tTEQ. No evaluation is available to indicate that dioxin-like toxicity of coplanar PCB congeners (DLC) is not an important contributor to tTEQ outside of the 11 ppm PCB footprint. DLC TEQ makes up an average of about 25% of tTEQ. Additionally, DLC TEQ may make a disproportionate and greater contribution to tTEQ in the food web (e.g. bird eggs) due to expected greater bioavailability of these PCB congeners.

3. The proposed AMEC/GP approach assumes that locations that are either unsampled or have no total dioxin TEQ measurements will be captured by the 11 ppm PCB footprint and its surrounding area. Currently D/F TEQ data are insufficient to characterize the extent of dioxin contamination in the Area 4 floodplain.

4. MDEQ analyses (detail in attached appendix materials) indicate that there are reasonably reliable correlations between D/F TEQ and total PCBs and with tTEQ (Figures 1 and 2). These correlations indicate that a statistically-based footprint could be developed that leverages the relationship between PCB and TEQ (D/F, DLC and tTEQ) with rigorous propagation of uncertainty in TEQ mapping. Maps would show probability of exceedance of specified TEQ thresholds as contours. These probabilities would account for the uncertainty in the PCB--TEQ relationship, so varying levels of conservatism could be considered as needed. The approach would leverage the cross-autocorrelation between PCB and TEQ to develop the mapping. There are relatively rigorous ways to do this as a multiple variable geostatistics analysis. An illustration of uncertainty (Figure 3) shows that at a PCB concentration of 11 mg/kg, tTEQ could be as high as 663 ppt (95% UCL) above a best estimate from the regression of 164 ppt.

ATTACHMENT 1

MDEQ's Comments on the DRAFT SRI Report, Area 4, OU-5 Kalamazoo River Superfund Site (09/09/2016)

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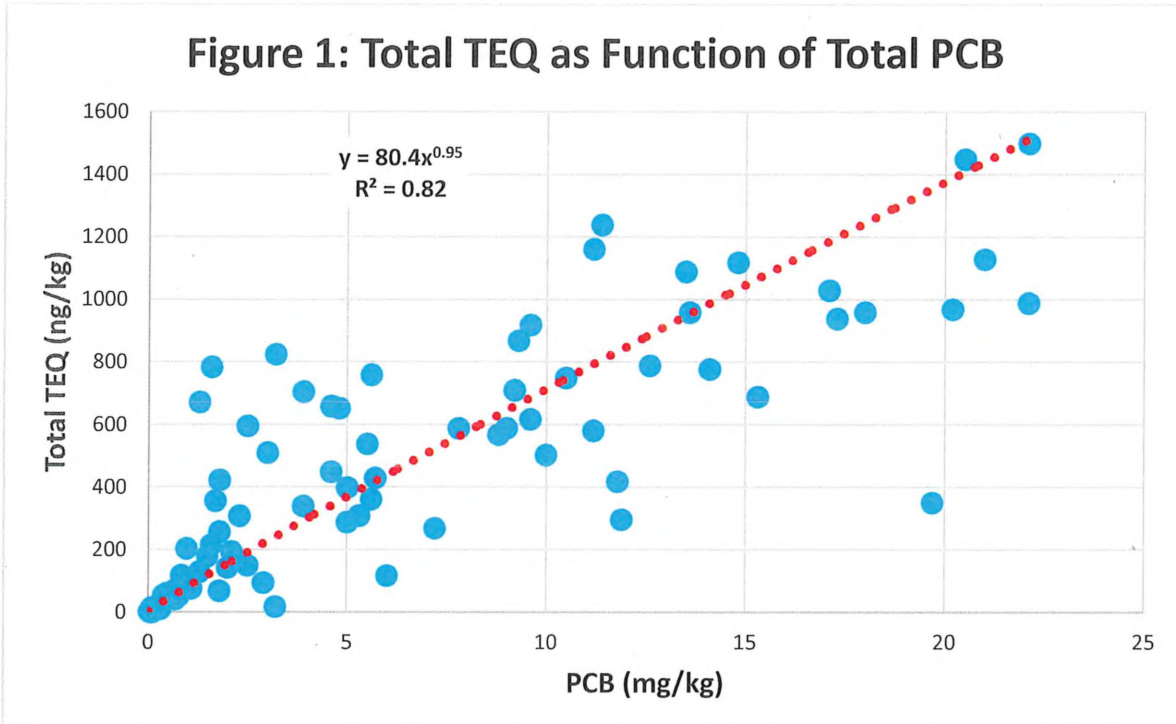

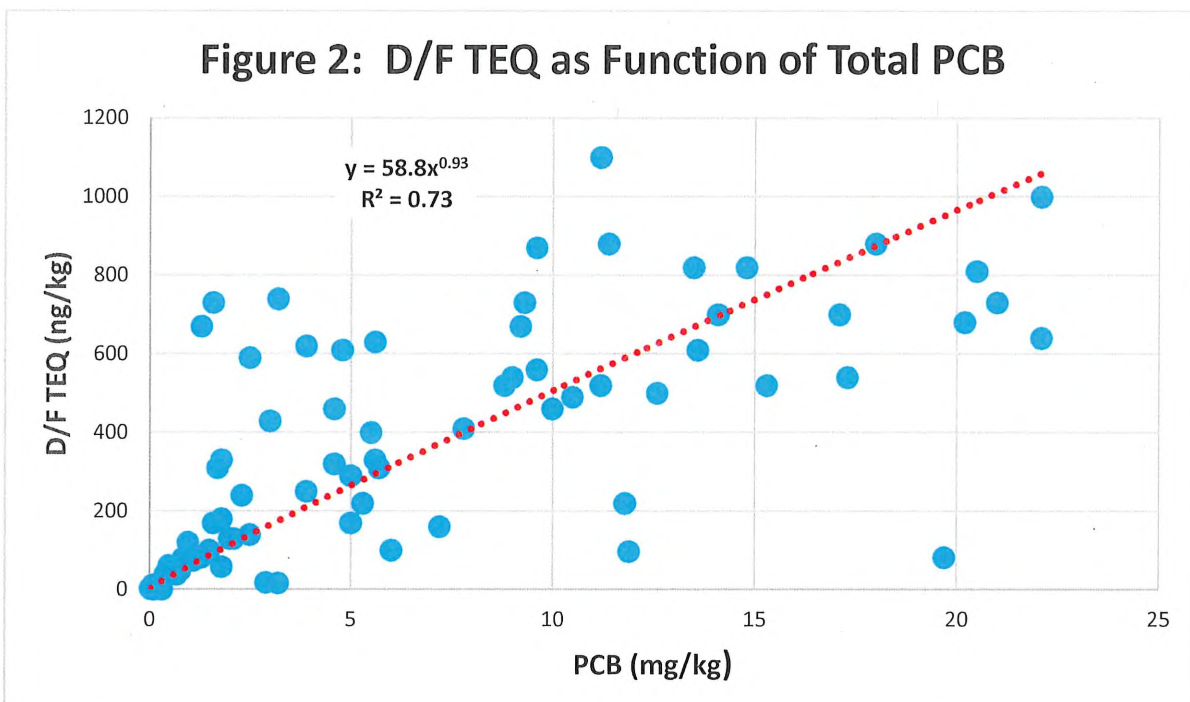

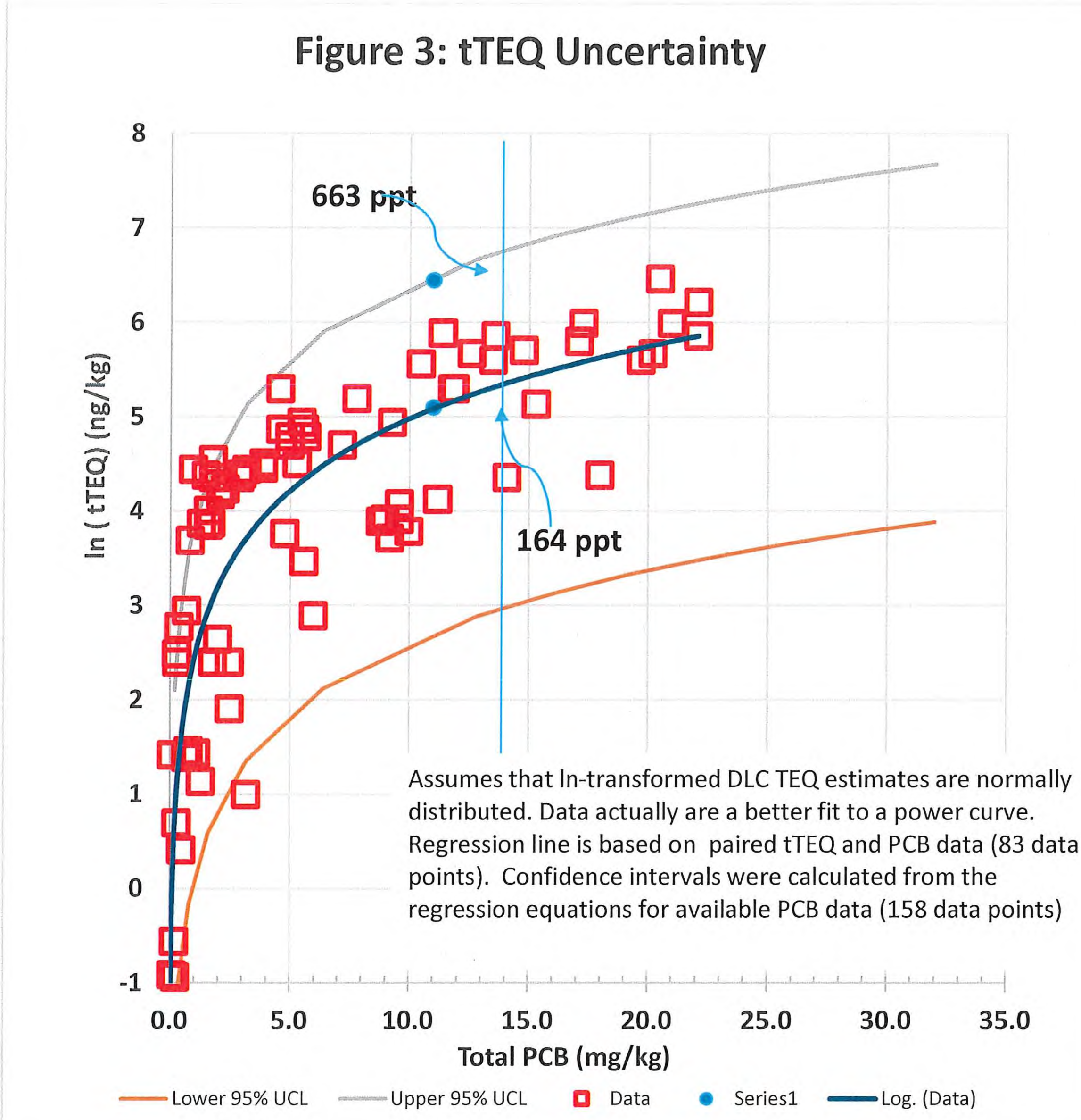

Regardless of the method ultimately selected, a more rigorous approach is needed to determine if the 11 mg/kg PCB footprint will be sufficient to address tTEQ in soil, and whether current data are sufficient for spatial characterization.

5. MDEQ has developed some illustrative plots showing how the 11 ppm PCB RAL footprint would need to change depending upon the dioxin TEQ RAL selected. As shown in the

attached graphics, the 11 ppm PCB footprint would not capture ecological tTEQ RALs of 120 (Figure 4) and 200 ppt (Figure 5). These RALs are not suggested as appropriate for Area 4; such values have been used for tTEQ (mainly D/F TEQ) contamination in upland soils at other sites. RALs will be developed as part of further consideration of ecological risks. Also, note that the lines showing extent of area for risk management in these figures have no statistical significance and are used only as a general illustration. MDEQ recognizes that a home range analysis will be performed as part the FS.

6. Spatially explicit TEQ mapping that includes statistical uncertainty would be ideal for development of TEQ footprint to overlay on the PCB footprint for development of a final footprint.

7. MDEQ recommends:
    a. Use separate RALs for D/F and DLC TEQ
    b. Use correlation between D/F TEQ and DLC TEQ in soil to examine variability in relative contribution of D/F and DLC TEQ and develop a range of RALs for tTEQ
    c. Use correlations between tTEQ and total PCB to:
        i. Estimate tTEQ for all locations where total PCB data are available.
        ii. Examine extent of tTEQ outside of 11 mg/kg PCB contours.
        iii. Use geostatistics or other appropriate method(s) to examine confidence in spatial characterization of the floodplain.
    d. Propose means to use the results in the analysis of home ranges.
    e. Evaluate gaps in spatial characterization of the floodplain using results from geostatistical analysis. Consider such gaps in evaluation of alternatives.

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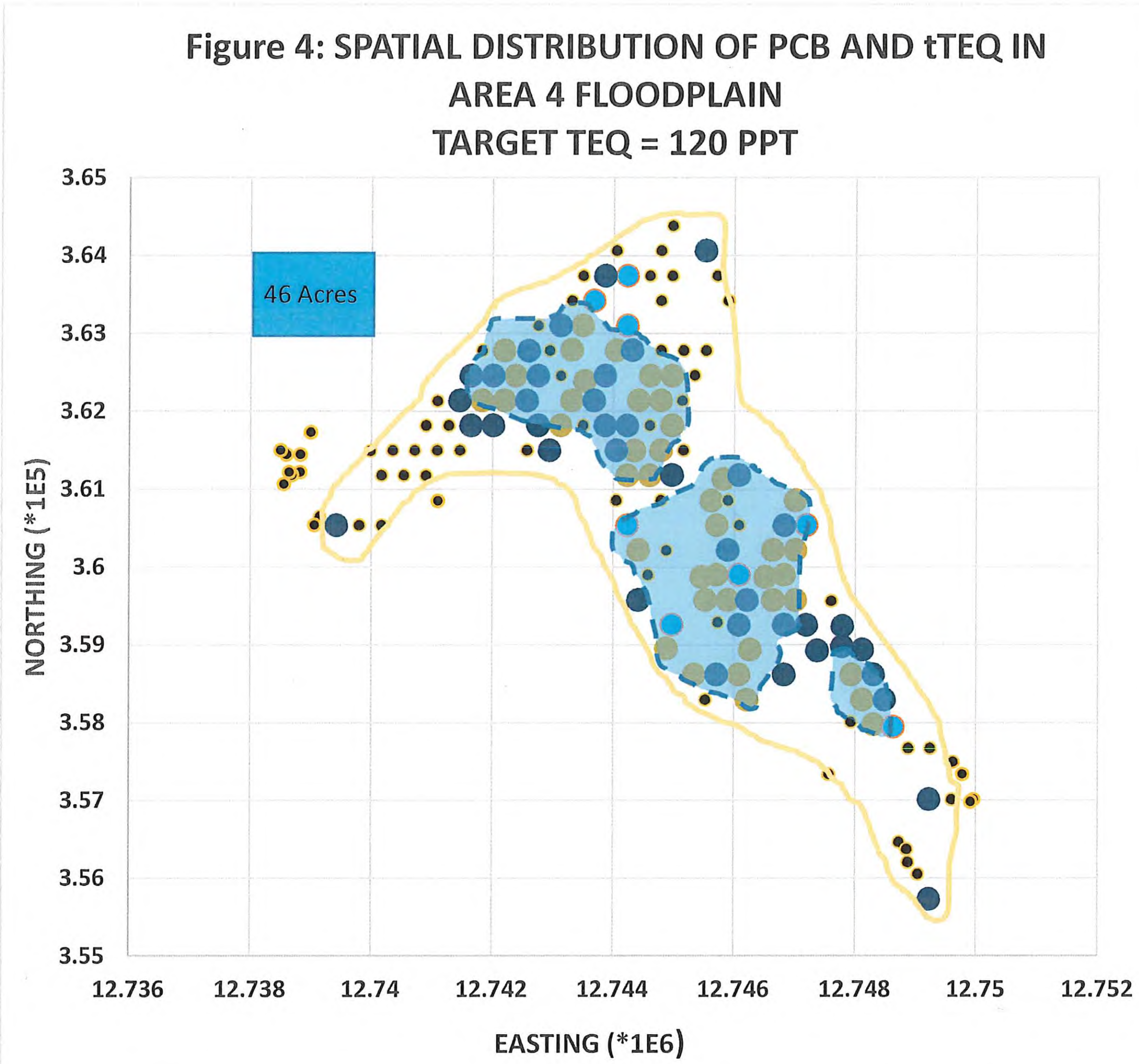


Legend:

Dark yellow dots – locations where PCB > 11 mg/kg

Light blue dots – locations where PCB < 11 mg/kg and DLC TEQ > 120 ppt

Dark blue dots – locations where PCB < 11 mg/kg, DLC TEQ < 120 ppt and total TEQ > 120 ppt

Black dots – all other sampled locations in the study area

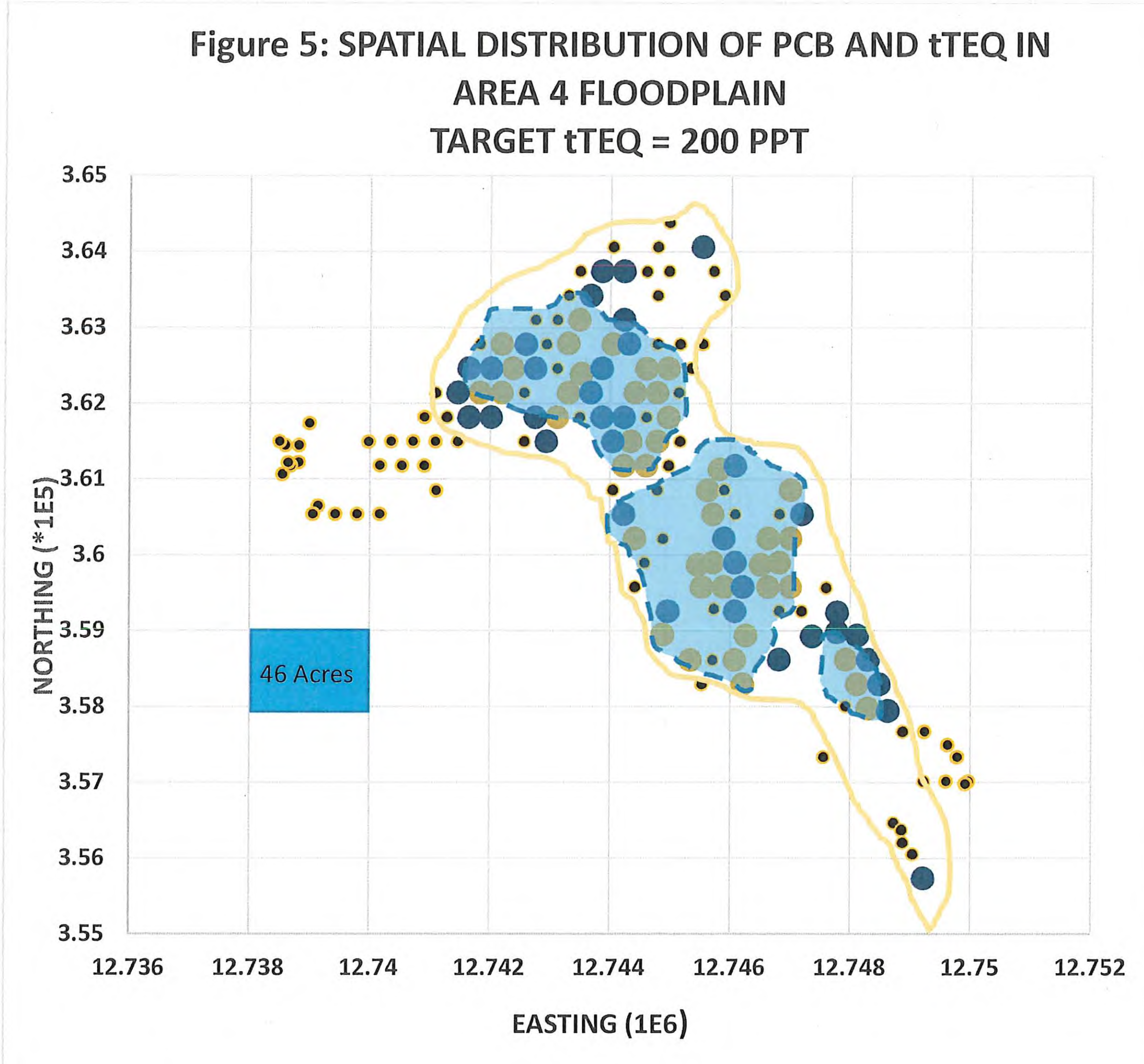
Blue Shaded Areas – hand drawn example of possible are subject to risk management used a PCB target of 11 mg/kg

ATTACHMENT 1

MDEQ's Comments on the DRAFT SRI Report, Area 4, OU-5 Kalamazoo River Superfund Site (09/09/2016)

July 14, 2017

Yellow Shaded area – hand drawn example of possible area subject to risk management using a target TEQ of 120 ppt. For illustrative purposes only.



Legend:

Dark Yellow – locations where PCB > 11 mg/kg

Blue dots – locations where PCB < 11 mg/kg, DLC TEQ < 200 ppt and total TEQ > 200 ppt

Black dots – all other sampled locations in the study area

Blue Shaded Areas – hand drawn example of possible area subject to risk management used a PCB target of 11 mg/kg

ATTACHMENT 1

MDEQ's Comments on the DRAFT SRI Report, Area 4, OU-5 Kalamazoo River Superfund Site (09/09/2016)

July 14, 2017

Yellow Shaded area – hand drawn example of possible area subject to risk management using a target TEQ of 200 ppt. For illustrative purposes only.

ATTACHMENT 1

MDEQ's Comments on the DRAFT SRI Report, Area 4, OU-5 Kalamazoo River Superfund Site (09/09/2016)

July 14, 2017

APPENDIX

ATTACHMENT 1

MDEQ's Comments on the DRAFT SRI Report, Area 4, OU-5 Kalamazoo River Superfund Site (09/09/2016)

July 14, 2017

Supporting Discussion of Methodology

A PRG based on total PCB in floodplain soil was established to be protective of ecological receptors in Area 4. This PRG considered both toxicity of PCBs as a group and dioxin-like toxicity of coplanar PCB congeners (DLC). Subsequently, additional data were collected to directly address total dioxin/furan-like activity in soils. A data set that reported total PCB and TCDD equivalents (TEQ) for both coplanar PCB and 2,3,7,8-substituted dioxin/furan (D/F) congeners. The following observations are based on an analysis of this data set. The analysis is intended to provide background for comments provided on the Area 4 SRI.

Initially, data were simply plotted in several ways to determine if useful relationships among total PCB, DLC TEQ and D/F TEQ could be identified. A close relationship was observed for Total TEQ as a function of total PCB, and D/F TEQ as a function of total PCB. The best fit, among functions available in EXCEL, was a power function that explained 82 and 73 percent of variability.

The plot (Figure 6) of D/F TEQ versus DLC TEQ suggests a reasonably consistent relationship, also best estimated, based on R^2, with a power function which accounted for over 60 percent of variability. The power function was used in calculations that follow. The relative contribution of D/F TEQ to tTEQ is about 75% over the range of PCB concentrations observed in the available dataset.

DLC, D/F and total TEQ were estimated using the power functions for all locations where total PCB concentrations were available. Initially, no attempt was made to include uncertainty, so the analysis is screening-level and illustrative only. Subsequently, a regression of ln-transformed tTEQ was used to illustrate 95% upper and lower confidence intervals using the paired TEQ and PCB data set. A logarithmic regression was used for this analysis.

PCB data and calculated TEQ estimates were plotted on a single chart to represent spatial distributions by concentration. Latitude and longitude coordinates were available for 158 locations where total PCB data were available for surface soils (top 0 to 6"). The first subset of data used coordinates for all total PCB concentrations of 11 mg/kg or greater. This PCB concentration identifies the footprint of soil area(s) that are likely to be considered in development of alternatives in the FS. A second subset of data was plotted that included locations where total PCB concentrations were below 11 mg/kg and DCL TEQ concentrations were above 120 ppt. This value (120 ppt) was chosen as one that would not be unreasonable for a clean-up target for TEQ in soil, but is not intended as a suggested PRG. A third subset of data was identified as all locations where DLC TEQ was less than 120 ppt, but total TEQ was greater than 120. All remaining data were then plotted to show the extent of characterization. Finally, shapes were hand drawn around areas where total TEQ was likely to exceed 120 ppt to provide some visual context for the impact of considering TEQ in defining an initial footprint for the FS. This area appears significantly larger than an area defined only by PCB concentrations 11 mg/kg or more.

An additional plot used the same data, but focused on a total TEQ target of 200 ppt. This value represents a second target that is not unreasonable for ecological receptors exposed to TEQ in soils and is, again, not intended as a recommended PRG. This plot does not include a data subset for DLC TEQ. When 200 ppt is used as a target for TEQ, no DLC TEQ data > 200 ppt fall outside the footprint for total PCB at or greater than 11 mg/kg. Thus, these figures only show data for total PCB at or above 11 mg/kg, total TEQ at or above 200 ppt and outside the PCB footprint, and remaining data to show extent of characterization.

In all cases, the footprint based on PCB at 11 mg/kg and higher would appear to be expanded notably when TEQ is considered at the two levels chosen for the screening. If a PCB level was chosen from the two plots that would encompass footprints suggested by TEQ concentrations, these concentrations would be 2.3 and 3.7 for 120 and 200 ppt, respectively. Expansion of the footprint for total TEQ is driven by the addition of D/F TEQ. DLC TEQ considered in isolation suggests a total PCB PRG of 9.5 mg/kg and would not by itself expand the footprint defined by 11 mg/kg PCB substantially,

Findings seem sufficient to indicate a need for a rigorous spatial analysis with an uncertainty component to adequately define a protective PRG based on total TEQ. The analysis would be best if coupled with results of an updated ecological risk assessment for Area 4 floodplain soils and associated receptors. Examples of such analysis are provided in a separate comment.

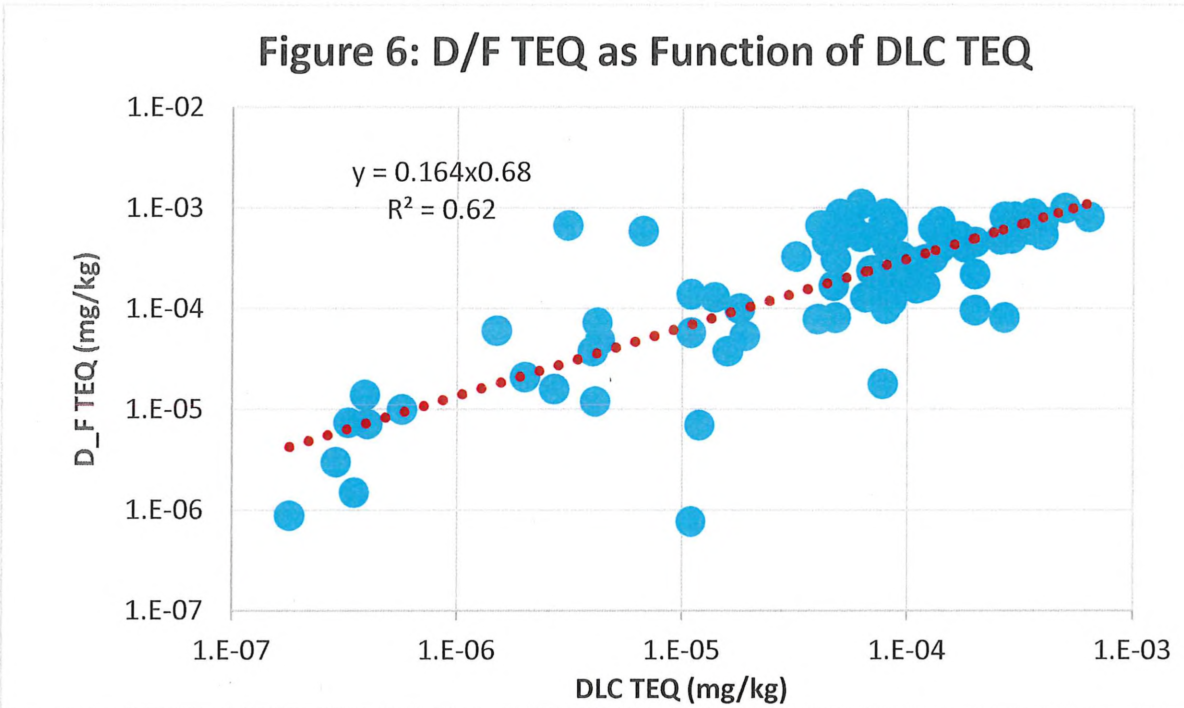


Figure 6: D/F TEQ as Function of DLC TEQ
y = 0.164x0.68
R² = 0.62
D_F TEQ (mg/kg)
DLC TEQ (mg/kg)
1.E-02
1.E-03
1.E-04
1.E-05
1.E-06
1.E-07
1.E-07
1.E-06
1.E-05
1.E-04
1.E-03

Document:	DRAFT Supplemental Remedial Investigation Report, Area 4, OU-5 Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site (September 2, 2016)			
Comment Author:	Michigan Department of Environmental Quality			
Comment #	Page	Section and paragraph	If applicable, specific quotation from text	Comment
Specific Comments				
	ES-3	Area 4 River System	Land use within this segment of river consists almost entirely of recreational wooded areas that are State-MDNR or government-owned lands. No current residential land use exists within Area 4.	The MDEQ agrees that no current residential land use exists within Area 4. However, some land parcels are zoned residential. Edit the document to make this clarification.
	ES-3	Area 4 River System	The USEPA defined sediment in Area 4 as deposited material within the area that is inundated for at least 30 consecutive days per year.	Remove the reference to 30 days of inundation, as the criteria for determining sediment versus soil has not been formally established.
	ES-4	Area 4 River System	Subarea H includes the area of inundation along Schnable Brook.	Provide clarifying text as to why Subarea H includes inundation areas, but none of the other subareas do.
	ES-6	Hydrodynamics	After dam removal, the flow is predicted to remain within the riverbanks during 2-year flood events, and only near-bank floodplains downstream of RM 45.5 are expected to be inundated during 10-year flood events.	Flows that remain within the riverbanks during 2-year flood events are not consistent with natural channel design. For use in the Feasibility Study (FS), the MDEQ's position is, and has been, that any river remedy should include as many elements of natural channel design as possible, especially including connectivity with the floodplain where feasible.
	ES-8	Nature and Extent	The analytical results indicated that D/Fs are a COI in Area 4 soil and may or may not be collocated within the anticipated PCB remedial footprint.	Not being able to determine the collocation, or lack thereof, of PCBs and dioxins and furans (D/Fs) is a vital data gap. This data gap must be addressed prior to any FS evaluations of remedial alternatives. To aid in this investigation, the MDEQ has previously investigated the potential for correlations between D/F Total Equivalents (TEQ) and Total PCB in Area 4 (see Attachment 1 to this comment set).
	ES-9	Table ES-1 (and similar)	General summary statistics table comment.	Any summary sample statistics tables should present the number of samples (n), even if the sample counts are stated in the text.
	ES-9	Table ES-2	---	Revise this table to include the statistics for a.) near shore left descending, b.) near shore right descending, and c.) center for each subarea and interval.
	ES-21	D/Fs Fate and Transport	Potential sources of D/Fs are different from those of the PCBs in that a broader range of sources, both continuing and discontinued, exists for D/Fs.	Remove this text (and similar statements elsewhere in the text) from the report. For purposes of this report, the D/Fs should be assumed to be associated with the mill properties. If this is not the case, then steps must be taken to definitively identify these sources, including additional floodplain sampling in Areas 1, 2, and 3, and background studies.
	1-4	1.3.2 PCBs Use and Disposition	---	The Area 4 Supplemental Remedial Investigation (SRI) is currently being revised to include a risk assessment focused on D/Fs. As such, a similar discussion of D/F use and disposition (similar to this referenced section) should be included.
	2-1	2.0 SUPPLEMENTAL REMEDIAL INVESTIGATION OF STUDY AREA	The SRI sampling and investigation work completed in Area 4 was designed to accomplish several key objectives: ... Estimate contaminant extent of PCBs, dioxins and furans (D/Fs), and DLCs in key media.	The MDEQ agrees that the SRI sampling and investigation work completed in Area 4 was designed, in part, to estimate contaminant extent of PCBs. However, while a subset of samples was analyzed for D/Fs, this SRI work was not designed to determine the extent of D/Fs. If the goals for determining PCB and D/F extents were the same, then the same number of samples would have been collected and analyzed for each. Revise this statement (and elsewhere as appropriate in the text) accordingly.
	2-3	2.1.2 Bank Conditions and	Because of access limitations and burial by deposition and/or vegetation, only seven	Provide clarification of what is meant by "access limitations." Furthermore, Page 5-3 of this SRI states "Evidence of sediment deposition at erosion pin locations was relatively sparse." The statements about deposition at erosion pins on Pages 2-3 and 5-3 are contradictory. Revise the document

		Erosion Pin Surveys	of the original erosion pins could be located.	accordingly, including a similar discussion on Page 5-13.
	2-6	2.2.2 D/F and DLC Investigation	---	As stated in the MDEQ's comment above, this SRI work was not designed to determine the extent of D/Fs. Furthermore, as stated in the Executive Summary of this document, "The analytical results indicated that D/Fs are a Constituent of Interest (COI) in Area 4 soil and may or may not be collocated within the anticipated PCB remedial footprint." The potential for D/F extent to be a vital gap during FS alternative evaluation should be clearly stated in the text.
	3-6	3.5.2.1 Geomorphic Features	The segment of Area 4 upstream of RM 48.95 is characteristically different from the downstream remainder of Area 4. This upstream segment has little to no floodplains with steep slopes abutting the river, but the downstream segment of the river is bounded on either side by terraced geomorphic features, namely Lower Terraces.	The MDEQ agrees with this statement. However, for clarity, please revise the statement to read as follows: "The segment of Area 4 upstream of RM 48.95 is characteristically different from the downstream remainder *(comprising the majority of Area 4)* of Area 4. This upstream segment has little to no floodplains with steep slopes abutting the river, but the downstream segment of the river is bounded on either side by terraced geomorphic features, namely Lower Terraces. *(emphasis added)*
	4-1	4.1.1 SRI Sediment Results	The USEPA defined sediment in Area 4 as deposited material within the area that is inundated for at least 30 consecutive days per year.	Remove the reference to 30 days of inundation, as the criteria for determining sediment versus soil has not been formally established. As with Area 2, the dam-out model runs produced for Area 4 are limited for making definitive predictions as they are constructed with a trapezoidal channel that does not represent any future condition. The uncertainty introduced into analyses resulting from using a trapezoidal channel versus the current channel configuration or any future channel configuration should be discussed. This is a universal change for any discussion of the 30-day inundation period.
	4-3	4.1.1.2 Spatial Distribution of PCBs in Sediment	Only 11 of 190 samples exceeded 0.33 mg/kg, and no samples exceeded 5 mg/kg.	When discussing summarized sample statistics, results should be compared to relevant site criteria (e.g., 0.33, 2.5, 11 [milligrams per kilogram] mg/kg, etc.). Revise the document accordingly.
	4-5	4.1.1.4 Stream Tube and Surface-Area Weighted Average Concentration Development	---	The MDEQ agrees that stream tubes are useful for assessing areas of potential impact at the RI stage. However, the MDEQ notes that additional sampling will be required for remedial decisions.
	4-8	4.1.1.4 Stream Tube and Surface-Area Weighted Average Concentration Development	The SWACs shown on Figures 4-12a through 4-16b and listed in Table 4-2 support the conclusion that PCB concentrations are consistently higher in the downstream subareas than upstream and lower in the mid-channel sediment than sediment near the banks.	The concentrations in Subarea H (Schnable Brook), while lower than downstream areas, generally appear to be higher than upstream areas. This should be noted in the text, including the relevant discussion in Section 7.3.1.
	5-13	5.4 SUMMARY	As a result, banks will tend to become steeper, and the river will tend to widen unless banks are protected.	Without employing hard engineered bank protection (e.g., large rip-rap), erosion will continue to occur unless the river is properly designed to dissipate energy, access floodplains during flood events, and remedial designs incorporate as many additional elements of natural channel design as possible. Hard engineered bank protection does not achieve natural stream function, which is a key element of any remedial alternative for the MDEQ. Revise the RI accordingly, and incorporate this approach into future Area 4 FS alternatives.
	6-10	6.1.8 Uncertainties Analyses		The uncertainty section contains a series of inappropriate, poorly supported statements that fish intake assumptions are overestimated including (a) ingestion for SMB occurs only 7 months of the year (statement does not consider that anglers freeze fish and eat them year round) (b) the SMB fish population is insufficient to sustain sport fish angler intake assumptions (the 2015 AMEC analysis uses an invalid analysis of the total estimated Kalamazoo fishing population multiplied by intake rate, which is not a method used by EPA or state agencies to make risk management decisions or for the cleanup of waste sites) (c) the revised EPA AWQC indicates that fish consumption intake is overestimated for Kalamazoo subsistence anglers (the ambient water quality criteria is a national criteria developed using a set of several data bases, while the Kalamazoo fish intake assumptions are based upon sport fishing survey data from developed by West of Michigan residents). The various statements noted above, which are inaccurate, need to be removed from the document.

	6-16	6.2.2 Area 4 TBERA and 6.2.3 Problem Formulation		It seems more defensible to use a single set of TRVs for dioxin-like toxicity expressed as TEQs than to use one set for PCB congeners ("DLCs") and another set for PCDDs and PCDFs, as is in described in the SRI. This merits further discussion in technical work groups. For example, regardless of the thinking at the time of the Area 1 TBERA, it seems inappropriate to reject LOAEL data from ring-neck pheasant as a moderately sensitive species because its LOAEL was similar to the LOAEL from studies on chickens. The LD50 is for the pheasant is still much greater than for the chicken, but the dose-response curve appears to be less steep.
	6-23	6.2.6 Risk Characterization	In the D/F assessment, available egg tissue BAFs are based on D/F TEQ data using 1998 WHO avian TEFs, 2005 WHO mammalian TEFs, and 1988 NATO/Committee on the Challenges of Modern Society international toxicity equivalent (ITEQ) factors. The egg tissue BAFs used in the assessment are based on the 1998 WHO avian TEFs and the 1988 ITEQ factors. Uncertainty exists in the application of D/F TEQ BAFs that are not site-specific and may be based on data inconsistent with the Area 4 D/F congener pattern.	Since the time that the WHO reached consensus values for TEFs for PCDDs and PCDFs, additional research has shown that the relative potency of critical PCDF congeners may be three to six-fold greater for moderately sensitive and low sensitivity species relative to the highly sensitive species that informed the selection of TEFs. To the extent that moderately sensitive species are used in the analysis, this should be taken into account. Depending on the contribution of PCDFs to the total TEQs, using relative potency factors appropriate to each sensitivity group could significantly increase the calculated avian TEQs exposure to moderately sensitive and low sensitivity species. References for relative potency factors (RePs) in place of TEFs: • Cohen-Barnhouse AM, Zwiernik MJ, Link JE, Fitzgerald SD, Kennedy SW, Hervé JC, Giesy JP, Wiseman S, Yang Y, Jones PD, Wan Y, Collins B, Newsted JL, Kay D, Bursian SJ. 2011. Sensitivity of Japanese Quail (Coturnix japonica), Common Pheasant (Phasianus colchicus), and White Leghorn Chicken (Gallus gallus domesticus) Embryos to In Ovo Exposure to TCDD, PeCDF, and TCDF. Toxicol Sci. Jan;119(1):93-103 • Farmahin, R., G Manning, D Crump, D. Wu, L. Mundy, S. Jones, M.E. Hahn, S. Karchner, J. Giesy, S. Bursian, M.J. Zwiernik, T. Fredricks, and S. Kennedy. 2013. Amino Acid Sequence of the Ligand-Binding Domain of the Aryl Hydrocarbon Receptor 1 Predicts Sensitivity of Wild Birds to Effects of Dioxin-Like Compounds. Toxicological Sciences 131(1), 139–152.
	7-2	7.2 HYDRODYNAMIC MODELING RESULTS	Limited reliable flow and stage data were available to use in the 10-year and 100-year flow event modeling; therefore, the model outcomes may overestimate output parameters for these events.	Having limited reliable flow and stage data results in large uncertainties. These uncertainties can include underestimates of flow model outputs as well. Revise the text accordingly.